PRODUCTION OF HIGH ENERGY PHOTONS WITH IN-VACUUM WIGGLERS: FROM SOLEIL WIGGLER TO MAXIV WIGGLER

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Small gap wigglers become more and more attractive to produce high photon fluxes in the hard X-ray photon range. They use magnet blocks of high magnetization which resist much better to heating (baking, synchrotron radiation) than in the past, produce high magnetic field with numerous periods and are very compact. They also are a very good alternative to superconducting technology which requires special infrastructure, heavy maintenance and is not running cost free. SOLEIL has designed and built an in-vacuum wiggler of 38 periods of 50 mm producing 2.1 T at a minimum gap of 5.5 mm to delivered photon beam between 20 keV and 50 keV [1]. Already in operation, further improvements are presently in progress to push photons towards higher energy, in particular thanks to the operation at lower gap (4.5 mm). MAX IV and SOLEIL, in the frame of collaboration, have built an upgraded version of the existing SOLEIL wiggler with the target to extend the spectral at high energy (above 50 keV) but also at low energy (4 keV) with the same insertion device. The design of the existing magnetic system has been modified to reach 2.4 T at a minimum gap of 4.2 mm and includes taper operation to avoid undulator structure in the radiated spectrum at low energy. The paper presents the evolution of the original SOLEIL wiggler to the final version of MAXIV, including the design, the measurements and the magnetic corrections.

References

[1] O. Marcouille et al.: In-vacuum permanent magnet wiggler optimized for hard x-ray production, PRST-AB 16, 050702 (2013), pp. 1-11